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THE PURPOSE OF RESEARCH

ONE of the articles of the constitution of the Society of Sigma Xi provides that the president shall explain to the members-elect the aims and objects of the society, and it is in accordance with this requirement that I now have the pleasure of addressing those who have been, by our active membership, adjudged worthy of enlistment with us in the army of investigators and research workers whose goal is the discovery of all truth.

Our constitution sets forth that the society exists for the purpose of encouraging investigation in science, pure and applied, and limits its membership to those who have shown either noteworthy achievement as original investigators or who have given promise of marked ability in research; and if the reward of membership has not proved to be sufficiently adequate and compelling in the promotion of investigation, the society must, if true to its purpose, devise other ways of securing and developing the spirit of research, which is its excuse for existence.

With this in mind, I think, Professor Stieglitz, of the University of Chicago Chapter, has recently proposed that the society at large establish at least three Sigma Xi fellowships, with an income of at least $1,000 each, as a practical method of stimulating and strengthening ardor for research, since the award of a national Sigma Xi Fellowship would stamp the recipient as one of whom much is expected and would

[1] Presidential address to members-elect, Alpha Chapter, Sigma Xi Society, April 20, 1918.

encourage and enhance the working powers of the successful candidates.

Professor Mann, in his forthcoming report to the Carnegie Foundation, on Technical Education, discusses the various methods by which improved scholarship may be secured and he alludes to the part played by the possibility of membership in Phi Beta Kappa, Tau Beta Pi and Sigmi Xi, as valuable incentives to persistent application. But Professor Mann has sadly confused the ideals of the three societies when he puts them on the same basis. Scholarship, as Phi Beta Kappa and Tau Beta Pi know it, is vastly different from the scholarship that Sigma Xi exists to foster, and there are among you those whose mentality and methods of work, whose scholastic record would undoubtedly shut out from either of the first two but entirely justify your membership in the last. To be able to pass examinations of a conventional type, to follow along well-marked paths, even with occasional obstructions is in marked contrast, educationally, from blazing a new way. You have been judged, either on the evidence of actual accomplishment or on the promise of marked ability, to be capable of leading, rather than of following, of making discoveries for yourselves rather than of assimilating the results of others' work. The field included in the ideals of the society is unlimited. Science, either pure or applied, certainly includes everything that affects life and living, provided the matter be approached in a scientific spirit, and while the society in the past has emphasized pure science and is likely to do so even more in the future, so that the membership has been found largely among those who are searching for evidences of the abstract laws of scientific truth, it has also welcomed those who have applied such laws to the benefit of industry and of human development.

Professor Noyes, of the University of Illinois Chapter, has recently dwelt on the higher character of what he calls "discoveries" as compared with "inventions" though he grants that the society exists for the furtherance of both. He compares the value and genius of Faraday, a true discoverer, with the work of Morse, who applied only the earlier researches in electrical and magnetic induction to the construction of the telegraph. He refers to the basic discovery of Newton and disparages the applications of that discovery made by Newton's followers. In the same way, Pasteur's epochmaking discoveries in bacteriology and epidemiology might be compared with the applications made by his followers, Lister, Behring, Roux, Flexner, Metchnikoff and a host of others.

But the great majority of us can not hope to make discoveries and it may reasonably be asked whether the aim of the society will not be met quite as well by applying scientific law to practical problems as by persistently enquiring into some scientific field, a little corner of which seems to offer a chance for new discovery. Professor Titchener, some years ago, dwelt on the need for the true research worker to be unselfish, to forget the thought of reward either through some practical application or through financial appreciation and he held out to members the idealized promise that only in the consciousness of faithful service to an abstract desire for truth could reward be looked for.

But to an engineer, accustomed by training and habit to look on science and scientific laws as valuable only when capable of application and in these times when the whole world has been awakened to the fact that men skilled in research are indispensable to the prosecution of our world war, when the value of these very applications is everywhere recognized and when workers

are abruptedly snatched from the peacefulness of their quiet laboratories to tumult of the very battle-field itself, a plea for greater recognition in our membership of those whose interests lie in the practical side of science and a summons to a broader outlook in that field of enquiry may be permitted.

It is of course not forgotten that discoveries must always precede invention and that the smallest triumph in pure science may have unexpected and far-reaching results, so that the devoted investigator will always with us remain an honored and appreciated member. But in a world where unhappiness, injustice and distress are constantly in evidence, where conflict between classes is always on the point of breaking out, and where inefficiency and waste are everywhere, what greater service can the altruistic scientist do than to reduce the causes of the apparent sources of misery to known terms so that there may be some hope of reducing their effect if not of shutting them out altogether. The great Teacher promised that the poor we should always have with us. But it is not too much to look forward to that, through the more equable distribution of wealth, through better ways of fitting workmen to their tasks, through approved methods of reforming misdemeanants and of punishing criminals, we may greatly diminish the number of the poor. Why should not some of the researches of the society be made in the field of sociology, since we now honor with membership those who have studied practical problems in psychology. Why not in industries as well as in engineering?

Three fields, and doubtless there are others equally important, have suggested themselves to my mind as belonging to the category that I have tried to suggest: that of labor efficiency, that of industrial production, that of technical education.

The question of the efficiency and control of labor has always been perplexing to engineers and generally to employers. At the close of this present war, if the many predictions now being made have any basis whatever, the right answer to the labor problem must be found or else the whole world will be again bathed in blood in a still fiercer conflict, involving the very right to live, between employer and employee. It is predicted, as you know, not merely that all autocratic government will disappear, but also that labor will "come into its own," whatever that means. Recent happenings in Russia have not given evidence of the success of a government when the governors are narrowminded, unused to the consideration of large problems and unable to think of more than the present. Why should not this Society of Sigma Xi investigate some of the labor problems, as yet unsolved, in the hope of so definitely fixing fundamental laws that their permanence and binding character would be understood and perhaps made the basis of understandings otherwise impossible.

There would be many advantages in the trained scientific mind coming to the consideration of such a question as "Can a woman do the same amount of physical work as a man?" and settling it without reference to sentiment or public clamor. Some years ago, Mr. Frederick W. Taylor undertook to develop a body of scientific law that should govern the organization and operation of any industry and he gave to his studies the appropriate term, "Scientific Management," because, he said, such control is distinctively scientific in that it aims to correlate and to systematize all the best of modern developments in factory administration and to push development further in accordance with the principles discovered. It rests on laws and principles rather than on policies.

He emphasized the need for the adjustment of each individual to his special task, the need for better training for its better accomplishment and the predetermined and conscious stimulation of the workman to his greatest degree of exertion consistent with his continued health by means of a special reward in the form of a bonus for superior accomplishment. How to adjust an individual to any special task is plainly a matter for scientific study and the work of the late Professor Münsterburg, incomplete though it was, shows the vast possibilities of this kind of work. The recently devised tests for the fitness of aviators are of the same sort and the newly promulgated order of the War Department that all soldiers shall be tested by trained psychologists and the number of our faculty, members of this society, that have been taken for this purpose is another evidence of the feeling that there is a definite relation between the mind or attitude of the laborer and the work that he has to do.

One of the most important parts of Mr. Taylor's study was the investigation of the amount of work that a capable workman can produce in a day, a study carried on with a stop watch reading to fractions of a second and this led to an analysis of the elementary motions needed for any operation and to the elimination of all unnecessary ones. His work was however not exhaustive but rather suggestive and a great deal of investigation in his field remains to be done. Some attention has already been given to the inefficient management of household economy and to the possibility of applying the Taylor principles to domestic management. Our own department of domestic economy has published some suggestive bulletins on various phases of his subject although as in factories it is sometimes easier to point out the losses than it is to persuade the workers to avoid them. An amusing series of stories about "Efficiency Edgar" appeared in the *Saturday Evening Post* in 1916, giving an imaginary account of the possibilities of this important sort of efficiency housekeeping.

In the university we may not make our enquiries directly on the operation of factories but our university community is in many ways only a factory of a certain sort whose product is men and women instead of things and many factory problems may be studied here as well as elsewhere.

We might, *e. g.*, make scientific enquiry into such questions as:

What is the necessary rest period during the course of any working day?

Do students accomplish the same amount of work in the same number of days of a term, with and without vacations?

What tests can be applied to candidates for admission to the college of agriculture to determine their fitness for directing dairy work, or for agronomy, or for any other kind of agricultural work?

What inducements, that is, what kind of bonus, may be offered to students so that they shall be persuaded to really work for an education?

How shall a student know when he has reached the limits of his powers of application in the preparation of any lesson, so that a change of occupation is desirable?

How may competition be made use of in educational processes as in industry?

How much sleep does a student need?

How much food does a student need as compared with the military ration that has been found desirable?

Such studies would of course be widely different from the microscopic investigations of such subjects as:

"The Classification of the Larvæ of Ground Beetles," in zoology; "The Molecular Arrangements in the Camphor Series"

in chemistry; "The Fusarian Wilt in China Asters," in botany; or, "The Nature of Ionization of an Atom of Mineral Sulphide" in physics; to take a few of the subjects studied by those members admitted last year. But their general interest and value can not be gainsaid, nor can their fitness for presentation as evidence of the ability of the investigators for admission to the Sigma Xi Society be doubted.

Next to the many big problems of labor, crying for scientific treatment, come questions of industry. Industrial research is no new thing in America and the development of industrial Germany has been due to awarding governmental subsidies for chemical and other research workers. The Bell Telephone Company has had a research department for some forty years, advancing from a small beginning to a great institution, employing hundreds of scientists and engineers. In a recent address, the director of the research laboratory of the General Electric Company, Mr. Whitney, urged the value of research work in universities where the foundation for industrial advance can be well laid by trained workers. Dr. Steinmetz has urged many times the need of university training and has pointed out the fact that only because the demand for the results of scientific research has been so great that the universities have not been able to supply the demand the industries have had to enter the field of research themselves. He believes that some kinds of research can be best carried out by educational institutions, such as those requiring large amounts of time and attention, while others, requiring large amounts of material and power are better adapted to the industries. The latter also are more likely to limit the field of their investigations to some particular problem, to seek to meet some particular competition and to provide in some line a special efficiency.

The National Research Council is to-day, through coordination of research work, offering to the government the results of scientific studies of various war problems. The council has been able to assign properly qualified men to the solution of special problems as they have arisen. They have already pointed out the shortage of men properly equipped for high-grade research work and that the industrial efficiency of this country at the close of the war may be hindered by the failure of the universities to turn out men so qualified. In England the need for industrial research has led to various kinds of industry combining to maintain laboratories in which certain evident problems may if possible be solved. The Rockefeller Institute for medical problems and the Mellon Institute at Pittsburgh for the study of manufacturing operations are both splendid examples of the big returns that come from the application of pure science to problems of life and industry. In Professor Duncan's "Chemistry of Commerce," he says:

> Everywhere throughout America, wherever there is the smoke of a factory chimney, there are unsolved, exasperating, vitally important manufacturing problems, problems in glass, porcelain, starch, tanning, paints, drugs, meats, iron, oil, metallurgical products, problems wherever man deals with substances. It seems clear that these problems can best be answered by combining the practical knowledge and the large facilities of the factory with the new and special knowledge of the universities and by making this combination through young men who will find therein success and opportunity.

And what answer does Sigma Xi give to the call from industry for help in solving its insistent industrial problems? What work is going on in the chemical and physical and engineering laboratories that will bring direct aid to the sorely perplexed

managers of factories? But little, it must be confessed, though this may be from a failure of the industry to let its wants be known. Such subjects as "Arsenic in Filter Alum," "The Chemistry of Liquid Manure," "The Fertilizer Value of Activated Sludge," "The Effect of Gas-house Waste upon the Organic Matter in Streams" are recent general Sigma Xi studies in my own field. But special problems for particular manufacturers do not seem to reach the universities. Our eager workers do not seem to know of them and the practise seems to be growing of sending to the universities where laboratories and advice may be had agents of the industries, industrial Fellows, as they are called, to do work for special interests. Even the employees of the United States government come to the colleges and work on problems that the government needs to have solved.

The present war has brought to a crisis the failure of this country to provide for the manufacture of optical glass. Our navy has been begging from patriotic citizens their field glasses so that the ships of the navy shall not go blindly directed. England has felt the same lack and is meeting the urgency of the problem of manufacture by a special committee of scientists to whom has been referred such questions as "What are the desirable raw materials for optical glass?" "What are the optical properties of all the different kinds of glass?" "How should glass be tested for its optical properties?" "How should the surfaces of lenses be designed?" Why should not Sigma Xi workers give their attention to such practical problems?

In one of this year's *Atlantics,* is an article by Professor Ames, director of the Physics Laboratory of Johns Hopkins, describing in the most graphical way the applications of science to the carrying on of the war, as he himself saw it at the front. He confidently predicts the success of the Allies because, he says, at first the Germans profited by the advice of their scientists but now these have all been replaced by regular army officers, while, on the contrary, more and more have the operations of the Allies been guided by scientific advice. Professor Ames shows how geology, meteorology, physics and chemistry, each with many branches, are doing yeomen service and making success certain through the marked superiority of the Allies in the very kind of work that Sigma Xi exists to foster.

And finally there are problems of education to be treated with a scientific spirit. For educators are getting restless under the spur of constant criticism of methods and of results. So much is being said of the failure of universities to turn out men and women whose minds are really trained, who have more than a smattering of ideas in their heads, that faculties are asking themselves whether they are really alive to their responsibilities, and whether the time-worn theories of education may not need revision, in view of changed industrial and social conditions. Ex-president Eliot is a champion of revised teaching in the secondary schools, on the ground that present urban conditions do not train children to see and to hear accurately and that the present methods generally contain no significant element of sense training. He would cultivate mental vigor by association with bodily work and increase the power of mental concentration by work in carpentry and farming. Abraham Flexner goes farther and would eliminate all the old curriculum and build anew on the four foundation stones of science, industry, esthetics and civics, developing each from the child's senses and from laboratory training.

Perhaps a larger conception is found in

those who criticize the present methods for emphasizing the virtues of obedience and discipline and for failing to promote independence, and impulse, and constructive doubt, and spontaneous enquiry.

Undoubtedly modern educators substitute largely passive acceptance for creative thought, a substitution that is deadening rather than stimulating, and it is to the credit of Sigma Xi that thirty years ago it was founded to do its part in persuading students to see and to think for themselves and to make deductions, based on their own studies.

The old-fashioned teacher says that by the old régime was bred a sense of obligation, a respect for authority, a readiness to respond to the call of duty, traits that are sadly missed in the rising generation; while the opposition claim that these good qualities need not be sacrificed in the modern attempt to arouse individuals to mental alertness and self-reliance.

A few years ago, one of the former members of this chapter came to be in charge of a class in applied mechanics in a western university and he tried an experiment. Instead of teaching general laws by lecture and recitation, he gave out practical problems on pressures and on strength of beams and guided the students into a knowledge of the laws by which that particular problem could be solved. He reports a greater understanding of the principles than ever before and an unheard of enthusiasm for the subject. With so many of us teachers, why should not we turn our scientific minds on to the problems of effective teaching? It can not of course be altogether mechanical. We can not invent any adequate system of gauging the intelligence, or of regulating hours of study, of composing syllabi or of imposing quizzes, until work goes on with the pressure and dispatch of an engine room, the product accurately measured in kilo-watts or in foot-pounds. But we may properly make investigations into the subject with a view of getting the greatest return for the energy expended.

The questions of foundation and fundamental subjects needed in professional work is both delicate and important. Shall an engineering student spend twelve hours or five hours on analytics and calculus in preparation for civil engineering? is a question to be solved only by turning the technical school into a laboratory and experimenting on the subject. Shall physics be taught as theory or as a laboratory exercise and how many elementary principles of physics does an engineer really need? is another most pertinent question. Why does the engineer need to spend three years in his preparatory school on a modern language that apparently has no further bearing on his college course? is another perplexing question perhaps not so easily adjusted to laboratory tests. But experiments on inducements to study, on stimuli and incentives might be carried on almost without number. The general faculty have been considering inducements for the improvement of scholarship, all based on scholastic rank, on marks, an extraordinary spectacle that the faculty especially of arts, burdened with the task of imparting culture and mental discipline should think that scholarship can be compared and measured by numerical grades. What our society could do is to determine experimentally the best methods of teaching, the best methods of competition to compel students to rouse themselves and develop their ambition to excel. Once mothers gave their children in the spring nauseous doses of sulphur and molasses to purify their blood and for many years that magic phrase was sufficient justification for the practise. Is there not something of the same sort going on in educational matters, and how shall

the truth be known unless we, who have educational laboratories at our hands, make use of them.

May I then express the hope that among you, the newly elected members, there may be some who will find the subjects for their future experimental work, not in abstract research, without thought of reward, carried on in the sole interest of science, but rather in modern practical applications, in attempted solutions of the many insistent problems of labor, industry and of education, that the existence of the university may be more fully justified and the purpose of the Society of Sigma Xi the better realized.

H. N. Ogden

Cornell University

INDUSTRIAL RESEARCH AND NATIONAL WELFARE[1]

I have no justification for expressing views about scientific and industrial research except the sympathetic interest of an observer for many years at rather close range. One looking on comes to realize two things. One is the conquest of practical life by science; there seems to be no department of human activity in which the rule of thumb man has not come to realize that science which he formerly despised is useful beyond the scope of his own individual experience. The other is that science like charity should begin at home, and has done so very imperfectly. Science has been arranging, classifying, methodizing, simplifying everything except itself. It has made possible the tremendous modern development of the power of organization which has so multiplied the effective power of human effort so as to make the differences from the past seem to be of kind rather than of degree. It has organized itself very imperfectly. Scientific men are only recently realizing that the principles which apply to success on a large scale in transportation and manufacture and general staff work apply to them; that the difference between a mob and an army does not depend upon occupation or purpose but upon human nature; that the effective power of a great number of scientific men may be increased by organization just as the effective power of a great number of laborers may be increased by military discipline.

This attitude follows naturally from the demand of true scienific work for individual concentration and isolation. The sequence, however, is not necessary or laudable. Your isolated and concentrated scientist must know what has gone before, or he will waste his life in doing what has already been done, or in repeating past failures. He must know something about what his contemporaries are trying to do, or he will waste his life in duplicating effort. The history of science is so vast and contemporary effort is so active that if he undertakes to acquire this knowledge by himself alone his life is largely wasted in doing that his initiative and creative power are gone before he is ready to use them. Occasionally a man appears who has the instinct to reject the negligible. A very great mind goes directly to the decisive fact, the determining symptom, and can afford not to burden itself with a great mass of unimportant facts; but there are few such minds even among those capable of real scientific work. All other minds need to be guided away from the useless and towards the useful. That can be done only by the application of scientific method to science itself through the purely scientific process of organizing effort. It is a wearisome thing to think of the millions of facts that are being laboriously collected to no purpose whatever, and the thousands of tons of printed matter stored in basements never to be read—all the product of unorganized and undirected scientific spirit. Augustus De Morgan denying the divinity of Francis Bacon says "What are large collections of facts for? To make theories *from*, says Bacon to try ready made theories *by*, says the

[1] A statement made by the Honorable Elihu Root at the initial meeting of the Advisory Committee on Industrial Research of the National Research Council, held in New York on May 29, 1918.

history of discovery; it is all the same, says the idolator; nonsense, say we." Whichever it may be, the solitary scientist is likely to put a great part of his life into the pathetic futilities illustrated by De Morgan in the "Budget of Paradoxes." He needs chart and compass, suggestion, direction, and the external stimulus which comes from a consciousness that his work is part of great things that are being done.

This relation of the scientific worker to scientific work as a whole can be furnished only by organization. It is a very interesting circumstance that while the long history of science exhibits a continual protest against limitations upon individual freedom, the impulse which has called in the power of organization to multiply the effectiveness of scientific and industrial research to the highest degree is the German desire for military world dominion, supported by a system of education strictly controlled by government. All the world realizes now the immense value in preparing for the present war, of the German system of research applied at Charlottenburg and Grosslichterfelde. That realization is plainly giving a tremendous impetus to movements for effective organization of scientific power both in England and in the United States,—countries whose whole development has rested upon individual enterprise. It remains to be seen whether peoples thoroughly imbued with the ideas and accustomed to the traditions of separate private initiative are capable of organizing scientific research for practical ends as effectively as an autocratic government giving direction to a docile and submissive people. I have no doubt about it myself, and I think the process has been well begun in England under the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research, and in the United States under the National Research Council. I venture to say two things about it. One is that the work can not be done by men who make it an incident to other occupations. It can be encouraged of course by men who are doing other things, but the real work of organization and research must be done by men who make it the whole business of their lives. It can not be successful if parcelled out among a lot of universities and colleges to be done by teachers however eminent and students however zealous in their leisure hours. The other thing is that while the solution of specific industrial problems and the attainment of specific industrial objects will be of immense value, the whole system will dry up and fail unless research in pure science be included with its scope. That is the source and the chief source of the vision which incidently solves the practical problems.

We are thinking now mainly of science as applied to war; but practically the entire industrial force of mankind is being applied to war, so that our special point of view takes in the whole field. It is quite certain that if the nations on either side in this war had been without a great fund of scientific knowledge which they could direct towards the accomplishment of specific things in the way of attack and defense, transportation and supply of armies, that side in the war would long since have been defeated. Germany had the advantage at the start, because she had long been consciously making this kind of preparation with a settled purpose to bring on the war when she was ready. It would be the height of folly for the peaceable law-abiding nations of the earth ever to permit themselves to be left again at a disadvantage in that kind of preparation. Competency for defense against military aggression requires highly developed organized scientific preparation. Without it, the most civilized nation will be as helpless as the Aztecs were against Cortez.

We are not limited, however, to a military objective, for when the war is over the international competitions of peace will be resumed. No treaties or leagues can prevent that, and it is not desirable that they should, for no nation can afford to be without the stimulus of competition.

In that race the same power of science which has so amazingly increased the productive capacity of mankind during the past cen-

tury will be applied again, and the prizes of industrial and commercial leadership will fall to the nation which organizes its scientific forces most effectively.

MAXIME BOCHER[1]

Maxime Bôcher was born in Boston on August 28, 1867. His father, Ferdinand Bôcher, came to this country from France at the age of fifteen. His mother was Caroline Little, of Boston, a descendant of Thomas Little, who came to Plymouth in the early days of the colony and in 1633 married Anne Warren, the daughter of Richard Warren, who came in the *Mayflower*. Ferdinand Bôcher was the first professor of modern languages at the Massachusetts Institute of Technology; he was called to Harvard shortly after Mr. Eliot became president. Thus Maxime grew up under the shadow of the college, attending various schools in Boston and Cambridge; but it was chiefly by the stimulating influence of his parents, he tells us in the vita of his dissertation, that his interest in science was awakened.

He graduated at the Cambridge Latin School in 1883 and took the bachelor's degree at Harvard in 1888. Then followed three years of study at Göttingen, where he received the degree of doctor of philosophy in 1891, and at the same time the prize offered in mathematics by the philosophical faculty of the university. From 1891 till his death, which occurred at his home on September 12, he was a member of the department of mathematics. He married Miss Marie Niemann, of Göttingen in 1891. His wife and three children, Helen, Esther and Frederick, survive him.

He came to Göttingen at a time when Felix Klein was probably the most inspiring teacher of mathematics in the whole world. Breadth and accuracy of scientific knowledge and a true sense of proportion, combined with extraordinary powers of presentation, were characteristics of this great leader, whose scientific productivity had already secured for him high standing among mathematicians.

It was from this environment that Bôcher came to Harvard to take up the profession of mathematics. His skill as an expositor in the classroom, before a scientific audience, and on the printed page shone out from the beginning of his career, but the originality of his mind saved him from ever becoming a mere expositor. As a lecturer he was preeminent among American mathematicians.

It is not difficult in science to find important problems which can not be solved, or unimportant ones which can be. Bôcher was successful in discovering subjects on which the advanced student could work with a reasonable prospect of securing results of value. He did not foster research by excessive praise, and his pupils sometimes felt that he was unappreciative. But a scientific contribution of real merit never failed to secure his attention, and he had infinite patience in helping the student who was really making progress to develop his ideas, to see that which was new in its true perspective, and to put his results into clear and accurate language.

As a scientist Bôcher was highly critical. It was, however, the constructive work called for when criticism has exposed errors or disclosed deficiencies, not the destruction with which an unimaginative mind is content, that to him was the important thing. He had extraordinary powers of judgment, both within the domain of pure science, and in things relating to the policies of institutions. His judgment of men, too, was accurate. For these reasons he was unusually well qualified to take a leading part in the affairs of the American Mathematical Society, which came into existence at the beginning of his scientific career. He became its president, and he served with marked success on the editorial board of its *Transactions*. He also contributed in no small measure toward helping the university to build up a strong department of mathematics.

The decade in which Bôcher's career as a university teacher began was marked by an awakening of the science of mathematics in this country. His scientific contributions were

[1] Minute on the life and services of Professor Bôcher placed upon the records of the faculty of arts and sciences, Harvard University, at the meeting of October 22, 1918.

of a distinctly high order, and their volume was not small. He early took a stand among the foremost investigators of the country, and his work met with generous appreciation abroad. On invitation, he delivered an address at the St. Louis Congress in 1904 and a lecture at the Fifth International Congress of Mathematicians at Cambridge, England, in 1912, and he was exchange professor at Paris in 1913–14.

His life was lived within the academic walls, and while he took keen interest in current events of the world about him, his contact with men outside of university circles was not broad, and his judgment of them was sometimes severe. But when opportunity presented itself to help in time of trouble, he was quick to respond. He sought relaxation from scientific labor in literature, philosophy and music, rather than in social gatherings.

Those who stood nearest him will remember him best for the singleness of his purpose, the constancy of his effort, and the greatness of his ideals.

THE BALTIMORE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE American Association for the Advancement of Science will hold its seventy-first meeting in Baltimore from December 23 to 28, 1918. This will be the seventeenth of the Convocation Week meetings. The presence of war students at Johns Hopkins University and the necessary return to their home institutions of those taking part in the program has compelled a change from the normal dates.

The opening general session will be held on Thursday evening, December 26, in McCoy Hall, located at 311 West Monument Street. After a short address of welcome by Dr. Goodnow, president of the Johns Hopkins University, followed by general announcements concerning the meetings, the retiring president of the association, Dr. Theodore W. Richards, of Harvard, will deliver his address on "The conservation of the world's resources."

Regular meetings of the Sections of the Association will be held from Thursday morning to Saturday afternoon. The addresses of the retiring vice-presidents, to be delivered on those days, are as follows:

Section A.—Henry Norris Russell. "Variable stars."

Section B.—William J. Humphreys. "Some recent contributions to the physics of the air."

Section C.—William A. Noyes. "Valence."

Section D.—Henry Sturgis Drinker. "The need of conservation of our vital and natural resources as emphasized by the lessons of the war."

Section E.—George Henry Perkins. "Vermont physiography."

Section F.—Herbert Osborn. "Zoological aims and opportunities."

Section G.—Burton E. Livingston. "Some responsibilities of botanical science."

Section H.—Edward L. Thorndike. "Scientific personnel work in the United States army."

Section I.—George Walbridge Perkins. (No address—in France.)

Section K.—C.-E. A. Winslow. (No address—section not meeting.)

Section L.—Edward Franklin Buchner. "Scientific contributions of the educational survey."

Section M.—Henry Jackson Waters. "The farmers' gain from the war."

The registration headquarters will be in the lobby at the main entrance of Gilman Hall and will open on Thursday, December 26, and succeeding days at 9 A.M. Arrangements will probably be made to attend to the registration of those who call after 4 P.M. on Wednesday at the Assistant Secretary's office in the Southern Hotel. All of the meetings will be held in the new buildings of the Johns Hopkins University at Homewood. The Baltimore City College, downtown, may be used by one of the sections. The council will meet on Friday and Saturday mornings at 9 o'clock at Gilman Hall. The meeting of the general committee for the election of officers for next year and for the selection of the time and place of the next meeting will be held at the Southern

Hotel at 10 o'clock on Friday evening, December 27. The several sections of the Association will hold their sessions for the nomination of officers and the transaction of other business on the call of the chairman, in most cases just before or just after the address of the retiring vice-president.

It is expected that there will be a number of joint meetings and the usual smokers and dinners and meetings of specific societies and groups. Among these, may be mentioned the symposium of the Geological Society of America, the Association of American Geographers and Section E on the Relations of Geology to the War. The Geological Society will hold a smoker on Friday night and its annual dinner on Saturday night, followed by the address of its retiring president. The American Society of Naturalists will hold its usual dinner on Saturday night, followed by an address by Dr. Vernon L. Kellogg on "The German philosophy of war." Section F, on Saturday afternoon, will hold a general conference between governmental and laboratory zoologists. The American Association of Economic Entomologists will have a program giving particular prominence to the insect problems that are vital in connection with war activities. The Botanical Society of America, with the American Phytopathological Society, will hold a symposium on Our Present Duty as Botanists. The Botanists' annual dinner will be held on Friday night. The American Phytopathological Society will hold its tenth anniversary dinner on Wednesday night.

Baltimore hotels are:

Southern Hotel—Association Headquarters, Light and German Streets.
Emerson—Baltimore and Calvert Streets.
Belvedere—Charles and Chase Streets.
Rennert—Liberty and Saratoga Streets.
Stafford—Charles and Madison Streets.
Caswell—Baltimore and Hanover Streets.
New Howard—Howard and Baltimore Streets.
Altamont—Eutaw Place and Lanvale Street.
Eutaw Hotel—Eutaw and Fayette Streets.
Waldorf—Charles Street and North Avenue.

Reservations should be made well in advance, but it is not anticipated that persons in attendance will be unduly hampered in finding quarters. Camps Holabird and Meade are in proximity of Baltimore, it is true, and the hotels have been previously crowded by the wives and families of the Army men stationed at these camps; but this condition, it is thought, will be somewhat alleviated. For the convenience of members who prefer room and board in private residences in proximity to the meeting-places at the university, the association has been fortunate in securing the services, through the courtesy of President Goodnow, of a librarian of the Johns Hopkins University for the handling of such details as would regularly devolve upon the local committee. This librarian, Miss L. M. Bollman, is now advertising for rooms in private residences and is asking for rates on (1) room with board, (2) room without board, and (3) board only, the latter for the convenience of those members who are located downtown but wish to dine in proximity to the university. Miss Bollman will maintain a list, available to members of the American Association and the affiliated societies, of all accommodations listed under the above three headings.

Members of the association and the affiliated societies will, doubtless, realize that a reduction on railway fares is not practicable at a critical time such as this. The assistant secretary, at the time of his interview with the United States Railroad Administration, was assured that the only exceptions to this policy were in the cases of the gatherings of the veterans of the Civil and Spanish wars and of the State Agricultural Fairs, the latter having precedence because of the need of stimulating food production.

The following affiliated societies have indicated their intention to meet in Baltimore during Convocation Week:

American Federation of Teachers of the Mathematical and the Natural Sciences.—Will meet on date to be announced. Secretary, William A. Hedrick, Central High School, Washington, D. C.

American Physical Society.—Will hold joint sessions with Section B, A. A. A. S., on dates

to be announced. President, H. A. Bumstead. Secretary, Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

Optical Society of America.—Will meet on Friday, December 27. President, F. E. Wright. Secretary, P. G. Nutting, Westinghouse Research Laboratory, East Pittsburgh, Pa.

Society for Promotion of Engineering Education.—Will meet on date to be announced. President, John F. Hayford. Secretary F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Geological Society of America.—Will meet on Friday and Saturday, December 27 and 28. Joint meeting with Association of American Geographers, afternoon of December 28; joint meeting with Section E, A. A. A. S., on night of December 28. President, Whitman Cross. Secretary, E. O. Hovey, American Museum of Natural History, New York, N. Y.

Association of American Geographers.—Will meet on Friday and Saturday, December 27 and 28. Joint meeting with the Geological Society of America on the afternoon of December 28. President, Nevin M. Fenneman, 3755 Broadway, New York, N. Y. Secretary, O. L. Fassig (absent).

Paleontological Society of America.—Will meet on Saturday, December 28. President, F. H. Knowlton. Secretary, R. S. Bassler, U. S. National Museum, Washington, D. C.

American Society of Naturalists.—Will meet Saturday morning, December 28. Annual dinner, Saturday night. Secretary, Bradley M. Davis, Statistical Division, U. S. Food Administration, Washington, D. C.

American Society of Zoologists.—Will meet on Thursday, Friday and Saturday, December 26 to 28. Joint session with American Society of Naturalists Saturday morning, December 28. President, George Lefevre. Acting Secretary, W. C. Allee, Lake Forest College, Lake Forest, Ill.

American Association of Economic Entomologists.—Will meet Thursday and Friday, December 26 and 27. President, E. D. Ball. Secretary, Albert F. Burgess, Gipsy Moth Laboratory, Melrose Highlands, Mass.

Botanical Society of America.—Will meet on Thursday to Saturday, December 26 to 28. Joint sessions with Section G, A. A. A. S., and American Phytopathological Society on Thursday afternoon, December 26. Joint sessions with American Phytopathological Society on Friday and Saturday, December 27 and 28. Joint session with Ecological Society of America on Saturday morning, December 28. President, William Trelease. Secretary, J. R. Schramm, Cornell University, Ithaca, N. Y.

American Phytopathological Society.—Will meet from Monday to Saturday, December 23 to 28. Joint meetings with Botanical Society of America on Friday and Saturday, December 27 and 28. Tenth anniversary dinner, 6:30 P.M., Wednesday, December 25. President, Mel. T. Cook. Secretary, C. L. Shear, U. S. Department of Agriculture, Washington, D. C.

Ecological Society of America.—Joint session with Botanical Society of America on Saturday morning, December 28. Dates of other sessions to be announced. President, Henry C. Cowles. Secretary, Forrest Shreve, Desert Laboratory, Tucson, Arizona.

American Anthropological Association.—Will hold joint meetings with Section H, A. A. A. S., and American Folk-Lore Society on Friday and Saturday, December 27 and 28. President, A. L. Kroeber. Acting Secretary, Bruce W. Merwin, University of Pennsylvania Museum, Philadelphia, Pa.

American Folk-Lore Society.—Will hold joint session with American Anthropological Association on Friday, December 27. President, C. Marius Barbeau. Secretary, Charles Peabody, Harvard University, Cambridge, Mass.

American Metric Association.—Will meet on Friday and Saturday, December 27 to 28. The session of Saturday will be held at the Bureau of Standards, Washington. President, George F. Kunz. Secretary, Howard Richards, Jr., 156 Fifth Avenue, New York, N. Y.

American Society for Horticultural Science.—Will meet on Friday and Saturday, December 27 and 28. President, C. A. McCue. Secretary, C. P. Close, College Park, Md.

Society of American Foresters.—Will meet on Friday and Saturday, December 27 and 28. President, Filibert Roth. Secretary, E. R. Hodson, U. S. Forest Service, Washington, D. C.

School Garden Association of America.—Will meet on dates to be announced. President, J. H. Francis. Acting Secretary, V. E. Kilpatrick, 124 West 30th St., New York, N. Y.

The officers for the Baltimore meeting are:

President—John Merle Coulter, University of Chicago, Chicago, Ill.

Vice-Presidents—A (Mathematics and Astronomy): George D. Birkhoff, Harvard University, Cambridge, Mass. B (Physics): Gordon F. Hull, Dartmouth College, Hanover, N. H. C (Chemistry): Alexander Smith, Columbia University, New York. D (Engineering): Ira N. Hollis, Worcester Polytechnic Institute, Worcester, Mass. E (Geology and Geography): David White, U. S. Geological Survey, Washington, D. C. F (Zoology): William Patten, Dartmouth College, Hanover, N. H. G (Botany): A. F. Blakeslee, Cold Spring Harbor, N. Y. H (Anthropology and Psychology): Aleš Hrdlička, U. S. National Museum, Washington, D. C. I (Social and Economic Science): John Barrett, Pan American Union, Washington, D. C. K (Physiology and Experimental Medicine): Frederic S. Lee, Columbia University, New York. L (Education): Stuart A. Courtis, Department of Educational Research, Detroit, Mich. M (Agriculture): Henry P. Armsby, State College, Pa.

Permanent Secretary—L. O. Howard, Smithsonian Institution, Washington, D. C.

General Secretary—O. E. Jennings, Carnegie Museum, Pittsburgh, Pa.

Secretary of the Council—(No election).

Secretaries of the Sections—A (Mathematics and Astronomy): Forest R. Moulton, University of Chicago, Chicago, Ill. B (Physics): George W. Stewart, State University of Iowa, Iowa City, Iowa. C (Chemistry): Arthur A. Blanchard, Massachusetts Institute of Technology, Cambridge, Mass. D (Engineering): F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa. E (Geology and Geography): Rollin T. Chamberlin, University of Chicago, Chicago, Ill. F (Zoology): W. C. Allee, Lake Forest College, Lake Forest, Ill., in absence of Herbert V. Neal. G (Botany): Mel T. Cook, Agricultural Experiment Station, New Brunswick, N. J. H (Anthropology and Psychology): E. K. Strong, Jr., 1821 Adams Mill Road, Washington, D. C. I (Social and Economic Science): Seymour C. Loomis, 82 Church Street, New Haven, Conn. K (Physiology and Experimental Medicine): A. J. Goldfarb, College of the City of New York, New York, N. Y. L (Education): Bird T. Baldwin, Walter Reed General Hospital, Washington, D. C. M (Agriculture): Edwin W. Allen, U. S. Department of Agriculture, Washington, D. C.

Treasurer—R. S. Woodward, Carnegie Institution of Washington, Washington, D. C.

Assistant Secretary—F. S. Hazard, Office of the A. A. A. S., Smithsonian Institution, Washington, D. C.

SCIENTIFIC EVENTS

A JOURNEY ROUND THE ARCTIC COAST OF ALASKA

A LETTER written by Archdeacon Stuck, at Fort Yukon, Alaska, in June of this year, describing a journey made by him last winter round the whole Arctic coast of Alaska, is abstracted in the *British Geographical Journal.* The journey, which naturally involved no small amount of hardship, afforded an unrivalled opportunity for gaining acquaintance with the Eskimo throughout the great stretch of country traversed, as well as for a comparative study of the work carried on among them by the various Christian organizations busy in that remote region. These Eskimo, the writer says, are "surely of all primitive peoples the one that has the greatest claim to the generous consideration of civilized mankind. Where else shall a people be found so brave, so hardy, so industrious, so kindly, and withal so cheerful and content, inhabiting such utterly naked country lashed by such constant ferocity of weather?" Everywhere he received from them

the greatest possible help and kindness, and brought away the warmest feeling of admiration and friendship. The start was made on the west coast first made known to the world by Cook and Kotzebue, Beechey, Collinson and Bedford Pim, and here it was possible to find some habitation, usually an underground igloo, on every night but one of the journey. Storms were encountered, but there were commonly fair winds and there were no special hardships, traveling being far more rapid than is usual in the interior. At Point Barrow a halt of two weeks gave opportunity for the study of the largest Eskimo village in Alaska. In spite of the advancing season the difficulties increased with the resumption of travel, March being the month in which the severest weather is to be expected here. Throughout the 250 miles to Flaxman Island the party saw only one human being and were housed only twice. "It is," says the writer, "the barrenest, most desolate, most forsaken coast I have ever seen in my life: flat as this paper on which I write, the frozen land merging indistinguishably into the frozen sea; nothing but a stick of driftwood here and there, half buried in the indented snow, gives evidence of the shore." The fortnight's travel along this stretch was a constant struggle against a bitter northeast wind with the thermometer 20° to 30° below zero Fahrenheit, and at night, warmed only by the "primus" oil cooking stove, the air within their little snow house was as low as from 48° to 51° below zero. The almost ceaseless wind was a torment, and the faces of all were continually frozen. There are Eskimo on the rivers away from the coast, but it was impossible to visit them. East of Point Barrow all the dog-feed had to be hauled on the sledge, and—for the first time since the archdeacon had driven dogs—they occasionally went hungry when there was no driftwood to cook with. The heaviest task however came on the journey inland to Fort Yukon. Beyond the mountains the winter's snow lay unbroken, and for eight days a trail down the Collen River had to be beaten ahead of the dogs. At the confluence of the Collen with the Porcupine Stefánsson and his party were met with, escorted on the way to Fort Yukon by Dr. Burke, of the hospital there. Stefánsson had lain ill all the winter at Herschel Island, and would never have recovered had he not finally resolved to be hauled 400 miles to the nearest doctor.

A PROPOSED BRITISH INSTITUTE OF INDUSTRIAL ART

WE learn from the London *Times* that the British Board of Trade in conjunction with the Board of Education and with the advice of representative members of the Royal Society of Arts, the Arts and Crafts Exhibition Society, the Art Workers' Guild, the Design and Industries Association, and various persons and organizations connected with manufacture and commerce, have framed a scheme for the establishment of a British Institute of Industrial Art, with the object of raising and maintaining the standard of design and workmanship of works and industrial art produced by British designers, craftsmen and manufacturers, and of stimulating the demand for such works as reach a high standard of excellence.

The institute will be incorporated under the joint auspices of the Board of Trade as the department dealing with industry and the Board of Education as the authority controlling the Victoria and Albert Museum, and the methods by which it is proposed to achieve its objects include:

(*a*) A permanent exhibition in London of modern British works selected as reaching a high standard of artistic craftsmanship and manufacture.

(*b*) A selling agency attached to this exhibition.

(*c*) A purchase fund for securing for the state selected works of outstanding merit exhibited at the institute.

(*d*) The establishment of machinery for bringing designers and art workers into closer touch with manufacturers, distributors and others.

(*e*) The organization of provincial and traveling exhibition of a similar character, either directly or in cooperation with other organizations.

It is not at present intended that the exhibition of the institute shall be actually opened

until after the war, but all preparatory steps are being taken so as to avoid delay when peace has been restored. There is reason to hope that within a short period of years the institute may become self-supporting (except, of course, as regards the cost of purchasing for the nation selected works of outstanding merit). But it is necessary to provide for an adequate guarantee fund to ensure the stability of the scheme, at least during its initial stages, and thus to enable a high standard to be rigorously maintained without regard to immediate financial necessities. The Board of Trade confidently hope that such a guarantee fund will be forthcoming.

AGRICULTURE AND THE GOVERNMENT[1]

In the field of agriculture we have agencies and instrumentalities, fortunately, such as no other government in the world can show. The Department of Agriculture is undoubtedly the greatest practical and scientific agricultural organization in the world. Its total annual budget of $46,000,000 has been increased during the last four years more than 72 per cent. It has a staff of 18,000, including a large number of highly trained experts, and alongside of it stand the unique land grant colleges, which are without example elsewhere, and the 69 state and federal experiment stations. These colleges and experiment stations have a total endowment of plant and equipment of $172,000,000 and an income of more than $35,000,000 with 10,271 teachers, a resident student body of 125,000, and a vast additional number receiving instructions at their homes. Country agents, joint officers of the Department of Agriculture and of the college, are everywhere cooperating with the farmers and assisting them. The number of extension workers under the Smith-Lever Act under the recent emergency legislation has grown to 5,500 men and women working regularly in the various communities and taking to the farmer the latest scientific and practical information. Alongside these great public agencies stand the very effective voluntary organizations among the farmers themselves which are more and more learning the best methods of cooperation and the best methods of putting to practical use the assistance derived from governmental sources. The banking legislation of the last two or three years has given the farmers access to the great lendable capital of the country, and it has become the duty of both of the men in charge of the Federal Reserve Banking System and of the Farm Loan Banking System to see to it that the farmers obtain the credit, both short term and long term, to which they are entitled not only, but which it is imperatively necessary should be extended to them if the present tasks of the country are to be adequately performed. Both by direct purchase of nitrates and by the establishment of plants to produce nitrates, the government is doing its utmost to assist in the problem of fertilization. The Department of Agriculture and other agencies are actively assisting the farmers to locate, safeguard and secure at cost an adequate supply of sound seed. The Department has $2,500,000 available for this purpose now and has asked the Congress for $6,000,000 more.

[1] From President Wilson's Message to Farmers' Conference at Urbana, Ill., January 31 ,1918.

USE OF THE METRIC SYSTEM IN THE UNITED STATES[1]

More extensive use of the metric system in the trade and commerce of the United States is recommended in a resolution adopted by the United States section of the International High Commission, of which Secretary McAdoo is chairman.

The commission has regarded this subject as of particular importance in the United States. It is, of course, unnecessary for the United States section to recommend to the Latin-American sections of the commission anything in connection with the metric system, which is exclusively in use throughout Latin America. One of the main obstacles to documentary uniformity as between the United States and Latin America is to be found in the fact that the United States does not make the use of the metric system obligatory, and consequently its consular documents have to

[1] Publication authorized by the Treasury Department.

allow the use of that system merely as optical. Any uniform system of classifying merchandise, however, will require on the part of the United States thoroughgoing and complete adherence to the metric system.

Of more importance than statistical and administrative questions is the use of the metric system in trade. Now that the United States is obviously being drawn into closer and more vital commercial relations by the rest of the world, and particularly with Latin-America, our manufacturers and exporters will be obliged to meet the demands of their prospective customers in a somewhat more accommodating frame of mind than hitherto. Only the English-speaking nations still have to adopt the metric system of weights and measures, and among them the British Empire, or at least Great Britain, seems to be giving serious consideration to the necessity of making a change. Those who read the Commerce Reports of the United States Department of Commerce know how numerous are the opportunities necessarily allowed to pass by because of our inability to supply goods and machinery constructed in accordance with the metric system. The subject has now assumed a most practical character in the minds of those who are planning for post-war trade expansion.

The resolution adopted by the commission is as follows:

> The United States section of the International High Commission, having in view the present efforts to bring about the exclusive use of the metric system of weights and measures within the jurisdiction of the United States, resolves:
>
> I. That in the opinion of the section the adoption of that system would be productive of great advantage in the commercial relations of the United States with the other American republics.
>
> II. That the secretary of the section be directed to communicate a copy of this resolution to the chairman of the proper committees of the Senate and the House of Representatives.

AN ECOLOGICAL SURVEY OF THE PALISADES INTERSTATE PARK

LAST spring a cooperative ecological survey of the Palisades Interstate Park was established by the commissioners of the Park and the department of forest zoology of The New York State College of Forestry at Syracuse. The park is a large area of about 30,000 acres under the management of joint commissioners representing the states of New York and New Jersey. The park lies along the lower Hudson, including most of the scenic portion of the Palisades, on the west bank of the Hudson, and a relatively large area (the Harriman section) south and west of West Point, in the low wooded mountains of the Hudson Highlands.

This survey is intended to relate the wild life of the park to its numerous visitors, of which during the season just closed there have been about 48,000 campers, who averaged ten days each. Investigations of the birds have been made by Professor P. M. Silloway; the plankton organisms by Dr. Gilbert M. Smith and the fish by Dr. Chas. C. Adams and Professor T. L. Hankinson, assisted by A. E. Fivaz. The first season's field work has been completed and publications on the survey are in preparation from the standpoint of park utilization. The birds have been studied from an educational and recreational, as well as an ecological, point of view. The plankton for its bearing upon the problem of drinking water needed in the park, the fish, and the bathing facilities. The fish have been studied from the standpoint of food, education and recreation. The water storage area has been greatly increased by dams, creating and enlarging ponds and reservoirs. A system of management for these waters and the streams is to be worked out in harmony with the aims of the park.

Those in immediate charge of the work are Mr. Edward F. Brown, manager of the camp department of the park, and Dr. Charles C. Adams, forest zoologist of the college. This is the first comprehensive ecological survey systematically conducted and intended to relate primarily the wild life forest resources of a large public park to the educational, recreational, scientific and economic activities of the park. Many of the problems are the same

general character as those of our national parks. It will require several years to complete the plans now under way. Only the more urgent problems were begun this season. This survey has the hearty support of Mr. George W. Perkins, president of the Park Commissioners, and Dean F. F. Moon, of the College of Forestry.

SCIENTIFIC NOTES AND NEWS

The Société Médicale des Hôpitaux de Paris elected at a recent meeting, as corresponding members: Dr. Alexander Lambert, the president-elect of the American Medical Association, director of the medical service of the American Red Cross in France; Colonel James T. Case, editor of the *American Journal of Radiology* and chief of the radiologic service of the American Army in France; Professor William S. Thayer of Johns Hopkins, consultant to the American Expeditionary Force; Professor Morton Prince of Tufts College; Dr. Simon Flexner, director of the Rockefeller Institute for Medical Research, and Professor Beverley Robinson of the University and Bellevue Hospital, New York, a former intern of the Paris hospitals. At the same time, five British physicians were also elected, Sir Almroth Wright, Sir Bertrand Dawson, Sir Thomas Barlow, Sir Dyce Duckworth and Sir William Leishman.

We learn from the *Journal* of the Washington Academy of Sciences that among those at the Bureau of Standards are: Dr. F. W. McNair, president of the Michigan School of Mines, working on airplane engine problems; Dr. C. Nussbaum, formerly instructor in physics at Harvard University, engaged in the study of aeronautic instruments; Mr. E. P. Peck, formerly superintendent of operation of the Georgia Railway and Power Company, assisting in the standardization of electrical apparatus, and Lieutenant Henri Cretien, of the French army, who has been engaged in research work in military problems related to optics.

Professor G. F. Hull, of Dartmouth College, has been commissioned a major in the Ordnance Department, and is now in Washington.

Dr. William H. Ross, of the Bureau of Soils, has been commissioned a captain in the Chemical Warfare Service, and has been assigned to the Edgewood Arsenal, Edgewood, Maryland.

Professor Roswell P. Angier, of Yale University, is a captain in the Sanitary Corps, National Army, at the Hazelhurst Field Medical Research Laboratory, Mineola, L. I. He has been engaged in research work on psychological tests for aviators and in instructing other psychologists to give, at other aviation fields of the country, tests already devised.

Mr. B. H. Rawl, chief of the Dairy Division of the Bureau of Animal Industry since 1909, has been appointed assistant chief of the bureau.

In the U. S. National Museum Dr. Charles W. Richmond has been promoted to be associate curator of birds. Mr. Bradshaw H. Swales has been appointed honorary curator of birds' eggs.

Professor C. D. Child, head of the department of physics at Colgate University, is spending the current college year at Cornell University, engaged in special government research.

Lieutenant George O. Ferguson, Jr., associate professor of psychology at Colgate University, is stationed at Camp Lee, Virginia, in charge of the psychological examination of men in that camp.

Dr. Thomas P. McCutcheon, associate professor of chemistry of the University of Pennsylvania, has been assigned to overseas duty as consultant chemist in connection with the Chemical Warfare Service. Dr. McCutcheon, who is serving in a civilian capacity, spent the entire summer in government service at Washington.

D. Forest Hungerford, professor of chemistry at the University of Arkansas, has accepted a position with the United States De-

partment of Agriculture, with headquarters at Athens, Ga.

MR. N. A. BENGTSAN has been appointed special representative of the War Trade Board for work in Denmark and expects to leave soon for Copenhagen. During the past summer and autumn he has been commodity expert, in charge of cereal investigations in the Bureau of Research of the War Trade Board. Next autumn Dr. Bengtsan expects to resume the duties of professor of geography at the University of Nebraska.

PROFESSOR HENRY C. COWLES, of the University of Chicago, delivered a lecture at the meeting of the Geographic Society of Chicago on November 8, entitled "Forests and Forest Politics in Illinois," substituting for Mr. Currelly, who is detained in Toronto by illness.

AT the first scientific meeting of the Zoological Society of London for the present session Professor H. M. Lefroy read a paper, illustrated by lantern slides, on the wheat weevil in Australia, which has done so much damage to the stores of the Wheat Commission.

AT a meeting of the New York Section of the American Chemical Society on November 8, the program consisted of fifteen-minute addresses on the subject of an institute for cooperative research by chemists, biologists and manufacturers as an aid in the development of the American drug industry. Addresses were made by Dr. John J. Abel, Johns Hopkins University Medical School (by letter); Dr. P. A. Levene, Rockefeller Institute for Medical Research; Dr. C. L. Alsberg, U. S. Bureau of Chemistry; Dr. A. S. Loevenhart, American University Experiment Station; Dr. F. R. Eldred, Eli Lilly & Co.; Dr. D. W. Jayne, The Barrett Company.

PROFESSOR HENRI L. JOLY has given a course of three public lectures in English on France's share in the progress of science, at University College, London. The first lecture, on October 22, dealt with mathematics, astronomy and physical science; the second, on October 29, with chemistry and the natural sciences, and the third, on November 5, with biology and the medical sciences.

THE annual Thomas Hawksley lecture of the Institution of Mechanical Engineers, London, was delivered in the hall of the Institution of Civil Engineers on October 4, by Dr. W. C. Unwin, who took as his subject "The Experimental Study of the Mechanical Properties of Materials."

THE first annual Streatfield memorial lecture was delivered on October 17, at the City and Guilds Technical College, London, by Professor W. J. Pope, who took as his subject "The future of chemistry."

THE late Dr. Magnan, the French psychiatrist, left $5,000 to the Paris Academy of Medicine, to be applied to the foundation of a triennial prize for the best work on mental medicine.

WE learn from *Nature* that a memorial tablet and medallion of the late Mr. F. W. Rudler, in the quadrangle of the University College of Wales, Aberystwyth, in which Mr. Rudler was one of the earliest professors, 1876–79, was unveiled by Professor J. Mortimer Angus, on October 18. Mr. Rudler attached great value to students' geological excursions, in regard to which he himself rendered devoted service during his membership of the Geologists' Association. A few of his friends are, therefore, desirous of creating a fund to be capitalized, the annual income from which is to be devoted, on the recommendation of the professor of geology, towards the defrayment, where necessary, of the expenses of students during such excursions.

OVER $3,000 has been contributed to the Ramsay Memorial Fund in the United States up to November 1. It is hoped that the American subscription may reach $10,000 by January 1, 1919. Checks should be made payable and sent to the Ramsay Memorial Fund Committee, W. J. Matheson, treasurer, 2 Burling Slip, New York City.

PROFESSOR VOLNEY M. SPALDING, formerly professor of botany in the University of Mich-

igan, died at Loma Linda, California, on November 12, at the age of sixty-nine years.

Mr. Douglas C. Mabbott, biologist of the Biological Survey, U. S. Department of Agriculture, has been killed in action in France, at the age of twenty-five years. He was the author of papers on American wild ducks and their food habits.

Winthrop D. Foster, of the zoological division, U. S. Bureau of Animal Industry, died of pneumonia, on October 6, at Washington, aged thirty-eight years.

Clarence Sidney Verrill was lost on the *Princess Sophia*, which was wrecked on October 26, on the coast of British Columbia, with the loss of all on board. He was a mining engineer and was returning from the examination of a gold mine. He was the youngest son of Addison Emery Verrill, professor emeritus of zoology at Yale University.

The annual meeting of the American Association of Anatomists which is usually held during the Christmas vacation, has been postponed until the spring, and will be held possibly during the Easter recess.

The council of the American Psychological Association has voted to abandon the annual meeting scheduled for December, 1918. This action seemed advisable in view of the prospect of a very small attendance and many difficulties in the arrangements for the meeting.

Professor John W. Harshberger has been elected president of the University of Pennsylvania chapter of the Sigma Xi. The program for the session of 1918–19 is as follows:

November 20, The Engineering Departments, University of Pennsylvania, speaker—Professor Robert H. Fernald. "Is Our Fuel Supply nearing Exhaustion?"

January 22, The John Harrison Laboratory of Chemistry. Speakers—Provost Smith and Professor Walter H. Taggart.

March 12, The Psychological Department, College Hall. Speaker—Professor Lightner Witmer.

May 1, Joint Meeting of Phi Beta Kappa and Sigma Xi.

June 11, Gardens of the Zoological Society of Philadelphia. Speaker—Dr. Charles B. Penrose, president of the Zoological Society.

The meeting of the Connecticut Section of the American Society of Mechanical Engineers was held at Yale University on November 20. At the afternoon session in the Mason Mechanical Engineering Laboratory, Mr. J. Arnold Norcross presided and addresses were made by Mr. C. C. Sibley, plant engineer of the Marlin-Rockwell Corporation, on its new Dixwell Avenue Power Plant, and by Mr. C. E. Libbey, construction engineer, with Hollis French & Allen Hubbard, Boston, Mass., on the new University Central Heating Plant on Ashmun Street. At the evening session at 7.30 in Lampson Lyceum there was a joint meeting with the United States Naval Unit. Professor Breckenridge presided and an illustrated address was given by Mr. W. H. Blood, of the American International Shipbuilding Corporation, Philadelphia, Pa., on "The Building of the Hog Island Shipyard."

The Madrid correspondent of the *Journal of the American Medical Association* writes that Dr. Gomez Casas, physician of the Almeira prison, reported to his superiors the presence of influenza among the inmates of the prison early in the first epidemic. The governor of Almeira was not pleased at having his province invaded by the disease, and he summoned Dr. Casas and ordered him to sign a written report to the effect that he had been mistaken in his diagnosis, and retract his statements as to the existence of influenza in the prison. The Colegio Medico publicly announced that it would stand by Dr. Casas and subscribe the amount to pay the fine which a governor ignorant of his duties had imposed on him. At the same time an official protest was filed with the central public health authorities.

The Ordnance Department of the Army, particularly in the production and Inspection Divisions, is in need of men with training in the manufacture of explosives and the related raw materials. The manufacture of explosives is developing out of proportion to the number of men in the country who have had training and experience in that work. To meet this condition the War Department Committee on

Education and special training is establishing in the department of chemical engineering at Columbia University in the City of New York an Ordnance Department School of Explosives Manufacture. The object of this school is to give men with proper preliminary qualifications the training necessary to fit them for use by the Ordnance Department as commissioned officers in the supervision of factory operation and inspection of the finished products in plants manufacturing explosives and raw materials for explosives. The school will be only for enlisted men in the military service who are detailed for instruction in the school by the Ordnance Department.

UNIVERSITY AND EDUCATIONAL NEWS

THE will of the late Dr. John C. McClenathan, Connellsville, the value of whose estate is approximately $160,000, leaves the bulk, after the death of his widow, to Washington and Jefferson Colleges to erect a building to be known as the McClenathan Hall of Science.

THE Loyola University School of Medicine has recently been reorganized. The buildings and equipment of the Chicago College of Medicine and Surgery were purchased in September, 1917, making an important addition to the resources of the school. In the department of anatomy Dr. R. M. Strong, professor of anatomy at Vanderbilt University Medical School has been appointed professor and head. Dr. Thesle T. Job has been made assistant professor of anatomy.

AT Cornell University Mrs. Dorothy Russell Naylor, '13, has been appointed instructor in mathematics in place of Percy A. Fraleigh, '17, who has received leave of absence for National service. Frances G. Wick, '05, has been appointed acting assistant professor of physics for the current year.

DR. S. D. ZELDIN, of the College of Hawaii, has been appointed professor of mathematics in Olivet College.

DR. HORACE LEONARD HOWES has been appointed professor of physics at the New Hampshire College to succeed Professor V. A. Suydam, resigned. He is a graduate of Syracuse University in the class of 1905 and took his doctor's degree at Cornell in 1915. While at Cornell he was instructor in physics and research assistant to Professors E. L. Nichols and Ernest Merritt.

DISCUSSION AND CORRESPONDENCE

FOOD OF AQUATIC HEMIPTERA

THE reading of an interesting article in this JOURNAL by Hungerford,[1] that discussed the food supply of certain aquatic bugs, caused me to look up some of my own notes on the food of water-striders and other aquatic Hemiptera. These notes were recorded mainly from observations made near Urbana, Ill., during the years 1911–13 inclusive.

Hungerford[2] states: "In the literature dealing with aquatic Hemiptera, we are informed that without exception they are predatory: those which dwell upon the surface capturing such flies and other terrestrial insects as may chance to fall into the water, and those that pass their lives beneath the surface preying upon aquatic insects and similar organisms." My own conclusions, regarding the food of water bugs, formed from reading the literature on aquatic Hemiptera, if expressed briefly, would be very similar to those just quoted, with some exceptions.

At the present, I recall three writers who mention that aquatic bugs use other food besides insects. Miall[3] makes the following statement: "To this suborder [Heteroptera] belong a number of very common aquatic insects. They are all predatory, feeding upon small insects or crustaceans." This writer[4] points out that, "Nepa feeds mostly on small insects, Ranatra, upon the water-flea (Daphnia) and other aquatic animals." The following is another quotation from Miall:[5] The in-

[1] "Notes Concerning the Food Supply of Some Water Bugs," SCIENCE, N. S., Vol. XLV., pp. 336–337, 1917.

[2] *Ibid.*, p. 336.

[3] "The Natural History of Aquatic Insects," London, 1903, p. 346.

[4] *Ibid.*, p. 354.

sects in question are *Halobates* and *Halobatodes*. . . . They feed upon the floating bodies of dead marine animals, and may be seen to run out from such objects when alarmed by the approach of a boat. These insects belong to the Rhynchota (Hemiptera) and in some respects come pretty near to such forms as Hydrometra or Velia." Walker[6] has found once or twice several specimens of marine Hemiptera belonging to the group *Halobates*, gathered round floating pieces of seaweed, as if obtaining nutriment. However, it must be acknowledged, that practically nothing is known about the food of these creatures. McCook[7] has demonstrated that individuals of *Gerris remigis* feed readily on the juice "of finely ground boiled beef." They take such food, with avidity, even in their own habitat.

If a more critical study should be made of the food of aquatic bugs in general, in their various habitats, I believe that still further evidence would be accumulated, showing that considerable food, of the other kinds, besides insects, was used by these interesting forms. In fact Hungerford[8] himself has pointed out a number of exceptions, some of which I can substantiate from my own observations, and to which I can add others also from my own observations.

The following statements agree with those of Hungerford[9] to the extent that the aquatic bugs now to be mentioned, are not entirely predatory, nor is their food entirely that of insects: I have found by microscopic examination of the alimentary system that water-boatmen of the genus *Arctocorisa* feed on vegetable matter; diatoms and Oscillatoria have been identified. They probably obtain most of this from the ooze on the surface of the mud, at the bottom of the pond or stream. In order to obtain additional evidence, I placed some of the water-boatmen in shallow, glass dishes of water, with some of the ooze containing algal débris, as suggested by Hungerford,[10] but my observations were discontinued before I was satisfied definitely that these bugs scooped up this substance with their front legs, and used it as food. I also placed back-swimmers of the genus *Notonecta* in shallow, glass dishes of water and fed them with small crustaceans, such as copepods and ostrocods. The back-swimmers appeared to thrive on this food. By means of a similar experiment, I was able to demonstrate that the marsh-treader, *Hydrometra martini*, will feed on copepods tangled in the surface-film. This was more likely to occur when the water became somewhat stale.

It is well known that many members of the family Gerridæ, which consists of an assemblage of aquatic Hemiptera living on the water-film, feed mainly on terrestrial insects which fall into the water and float on its surface. Water-striders are considered to be entirely predatory in their manner of feeding, and so far as I know there is no statement to the contrary in the literature on aquatic Hemiptera. However, it may be of interest to state that I have definite proof that *Gerris remigis* and *Gerris marginatus* both feed, at times, on vegetable matter. The following statement is a modified extract, taken from my field notes: After having studied water-striders in their natural habitats for several months, especially with reference to their food relations, I decided that both *Gerris remigis* and *Gerris marginatus* were entirely flesh-eating. However, on October 14, 1911, this opinion was changed. At the time, I was making observations of the water-striders on the surface-film of a brook near Whiteheath, which is approximately eighteen miles southwest of Urbana. Small red fruits were observed, drifting downstream, and these attracted the attention of the water-striders at once. Both species seized them readily, *Gerris remigis* with the greater avidity, and pushed their beak-like mouth-parts through the outer skin, down into the inner fruit. Some of the fruits, with their attendant water-striders, drifted near the bank of the

[5] *Ibid.*, pp. 380–381.

[6] "On the Genus *Halobates* Esch., and Other Marine Hemiptera," *Entomologist's Monthly Magazine*, Second Series, Vol. IV., p. 231, 1893.

[7] "Nature's Craftsmen," New York, 1907, pp. 363–365.

[8] *Loc. cit.*, pp. 336–337.

[9] *Ibid.*

[10] *Loc. cit.*, p. 337.

stream, and with the aid of a large reading-glass attached to a pole, it was possible to see the feeding movements of the mouth-parts. Several observations were recorded later than this of specimens of *Gerris remigis* sucking the juices of these berries. Only on one other occasion was *Gerris marginatus* seen to use this fruit as food. The plant from which these fruits came is commonly known as the coral-berry or Indian currant, *Symphoricarpos vulgaris*. It is very common along the banks of the brook near Whiteheath.

I have found that, during my observations of the food habits of water-striders in captivity, while confined in aquaria, both species mentioned suck the juices of freshly killed *Physa* and *Planorbis*. They also feed on fresh beef, on the soft parts of banana fruit, and on the inner, softer parts of the skin.

These observations seem to add additional evidence to Hungerford's[11] contention that aquatic Hemiptera are neither entirely predacious, nor do they feed entirely upon insects. It is very likely that other observers could report further observations of the character that have been recorded here.

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SCIENTIFIC BOOKS

Wild Animals of North America: Intimate Studies of Big and Little Creatures of the Mammal Kingdom. By EDWARD W. NELSON. Natural-Color Portraits from Paintings by LOUIS AGASSIZ FUERTES. Track Sketches by ERNEST THOMPSON SETON. Published by the National Geographic Society, Washington, D. C., U. S. A.; 8vo, pp. + 385–612, folded frontispiece, 108 colored illustrations on text paper (not plates), 85 halftone illustrations. [This is essentially a reprint of two articles which appeared in the *National Geographic Magazine*, for November, 1916, and May, 1918. The changes comprise repaging beyond page 472, the readjustment of the matter on pages 473–475, the replacement of a half-tone on page 475, the rectification of page references to illustrations to accord with the new paging where needed, and readjustment of the matter from page 571 on, so as to admit 32 new illustrations of footprints and the captions to these.]

This is a work which meets to a gratifying degree the need for an essentially non-technical treatise upon the natural history of the mammals of North America. No living person is better equipped to carry to a successful conclusion such an undertaking than is its author. Nelson has contributed in the field of vertebrate zoology now for over forty years, to be explicit, beginning in July, 1876 (*Bulletin Nuttall Ornithological Club*, Vol. 1, p. 39). With a background of long experience in the field, and with further years of official connection with the United States Biological Survey and its unique resources in mammalogy, he has made available a brochure of pleasing amplitude and satisfying authoritativeness.

Between the colored pictures and the written sketches the public can gain from this contribution a better idea of our principal mammals than from any other available publication. It should awaken a generally greater interest in our native mammals, and this will help build up a desire for the conservation of the harmless and useful species such as has resulted from the public education in relation to our bird life. On the other hand it is important to be able to distinguish those mammals, chiefly of the order Rodentia, which are thoroughly inimical to human interests. People at large must know how to cope with these enemies. It would seem that a full knowledge of the natural history of such animals is essential to determining the most successful means of controlling them and to applying these means properly to the varying conditions throughout the country. Nelson's accounts of our injurious mammals are full of stimulative suggestions along these lines, and while the work as a whole can not be considered as an "economic" publication, its influence will go far to secure adequate popular consideration of these matters.

[11] *Loc. cit.*, pp. 336–337.

The species are taken up in groups, in so far as this can be done safely. Each biography, of which there are 119, is, as a rule, a composite applying to a number of near-related forms, thus simplifying matters of presentation, and avoiding repetition. A marked feature of the book is the degree of concentration attained; there is no trace of padding, and no room for baseless speculation, sentimentalizing or humanizing, such as characterize many current "nature" books. At the same time the style is animated and thoroughly entertaining, a gift of composition which Nelson has exercised in many preceding contributions. Here is an instance, unfortunately a rare one, in which a man who really knows the field has put out a popular book on a natural history subject.

Many are the portrayals which are evidently based on Nelson's own personal field knowledge, some of them involving facts here for the first time made known to science. His account of the behavior of kangaroo rats in Lower California is particularly apt in illustration of the above statement.

> During several nights I passed hours watching at close range the habits of these curious animals. As I sat quietly on a mess box in their midst . . . [they] would forage all about with swift gliding movements, repeatedly running across my bare feet. Any sudden movement startled them and all would dart away for a moment, but quickly return. . . . They were so intent on the food [grains of rice put out for them] that at times I had no difficulty in reaching slowly down and closing my hand over their backs. I did this dozens of times, and after a slight struggle they always became quiet until again placed on the ground, when they at once renewed their search for food as though no interruption had occurred. . . . While occupied in this rivalry for food they became surprisingly pugnacious. If one was working at the rice pile and another rat or a pocket mouse approached, it immediately darted at the intruder and drove it away. The mode of attack was to rush at an intruder and, leaping upon its back, give a vigorous downward kick with its strong hind feet. . . . Sometimes an intruder, bolder than the others, would run only two or three yards and then suddenly turn and face the pursuer, sitting up on its hind feet like a little kangaroo. The pursuer at once assumed the same nearly upright position, with its fore feet close to its breast. Both would then begin to hop about watching for an opening. Suddenly one would leap at the other, striking with its hind feet, . . . [producing] a distinct little thump and the victim rolled over on the ground. After receiving two or three kicks the weaker of the combatants would run away. The thump made by the kick when they were fighting solved the mystery which had covered this sound heard repeatedly during my nights at this camp.

The brilliantly coated paper used throughout this book although hard on sensitive eyes, is necessary to the handling of the halftone illustrations. The printing of both the colored and uncolored pictures in all the copies we have seen has been done with pronounced success. The color drawings by Fuertes are admirable and we are astonished at the success with which this noted bird artist was able to turn to mammals, the drawings of which in this contribution mark as far as we know his first efforts in the new field.

A critical reviewer might succeed in finding a number of small points to elaborate upon and of which to complain. For instance: It is trite to say that an Alaska brown bear is no more an *animal* than is a house fly. Yet here we have the title, "Wild Animals of North America," though there is an evident effort made in the subtitle to remedy the matter by using the expression, "*mammal kingdom.*" But here a taxonomic blunder is tumbled into! We can hardly believe that Nelson himself had anything final to say with regard to the title page of this book, but that the editor of the *National Geographic Magazine* got in his work here in the belief so characteristic of editors of popular magazines that their public must be talked *down* to.

But to pin the attention of the reader of this review upon such really minute defects would do violence to the facts in the case, which are that, according to the convictions of the reviewer, Nelson's "Wild Animals of North America" is more uniformly accurate and at the same time replete with information along many lines than any preceding book on American mammals. And even more, it may be declared with confidence that this book is

by far the most important contribution of a non-systematic nature that has appeared in its field in America.

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SPECIAL ARTICLES

THE SUBSTITUTION OF SACCHARIN FOR SUGAR

IF saccharin can be substituted for sugar it is evident that it must fulfill the functions of sugar and at the same time not produce harmful effects. As a sweetening agent, to be oxidized thereby furnishing energy and to increase oxidation in the body are three functions of sugar. It would seem that saccharin should fulfill admirably the function of sugar as a sweetening agent since it is about 500 times sweeter than sugar. There are some who think that the use of saccharin as a sweetening agent is harmful. The extensive investigations of Herter and Folin[1] for the referee board on the effect of saccharin on the nutrition and health of man show that the amount of saccharin that would ordinarily be used has no deleterious effect. Herter found, in fact, that such enormous doses as 4 grams of saccharin per kilogram of body weight could be given to rabbits without injury. It is recognized that saccharin can not fulfill the second function of sugar named, for it is not oxidized to give rise to energy, but passes through the body almost quantitatively unchanged. The object of the present investigation was to determine if it could fulfill the third function of sugar named, that is, does the ingestion of saccharin increase oxidation in the body. We[2] had already found that the ingestion of sugar, as well as the ingestion of the other food materials, produced an increase in catalase, an enzyme possessing the property of liberating oxygen from hydrogen peroxide, parallel with the increase produced in oxidation, by stimulating the digestive glands, particularly the liver to an increased output of this enzyme. Hence, the conclusion was drawn that the increase in oxidation following the ingestion of food was brought about by the increase in catalase. Our contention that catalase is the enzyme in the body principally responsible for oxidation is further supported by the fact, that by whatever means oxidation is increased in the body, there always results a corresponding increase in catalase, and by whatever means oxidation is decreased, there

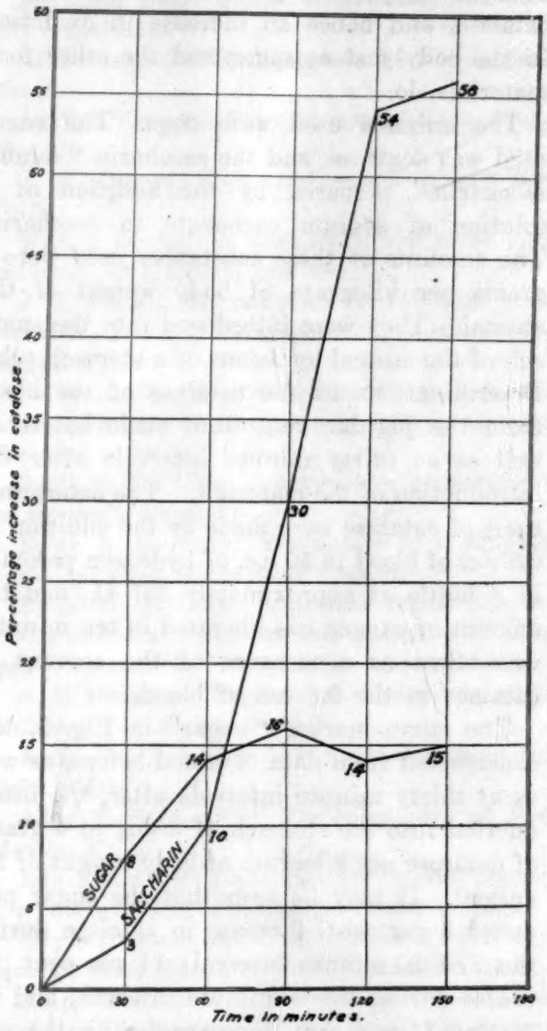

FIG. 1. Curves showing the increase produced in the catalase of the blood by the ingestion of saccharin and of sugar. The figures (0–180) along the abscissa indicate time in minutes; the figures (0–60) along the ordinate, percentage increase in catalase.

[1] Herter and Folin, United States Department of Agriculture, Report 94, 1911.

[2] Burge and Neill, *The American Journal of Physiology*, Vol. 47, No. 1.

results a corresponding decrease in catalase. Stated more specifically, the present investigation was begun to determine if the ingestion of saccharin would produce an increase in catalase, and hence an increase in oxidation in the body just as sugar and the other food materials do.

The animals used were dogs. The sugar used was dextrose, and the saccharin "soluble saccharin," prepared by the addition of a solution of sodium carbonate to saccharin. The amounts of these substances used were 4 grams per kilogram of body weight of the animal. They were introduced into the stomach of the animal by means of a stomach tube. Determinations of the catalase of the blood from the jugular vein were made before as well as at thirty minute intervals after the introduction of the materials. The determinations of catalase were made by the addition of 0.5 c.c. of blood to 50 c.c. of hydrogen peroxide in a bottle at approximately 32° C., and the amount of oxygen gas liberated in ten minutes was taken as a measure of the amount of catalase in the 0.5 c.c. of blood.

The curve marked "sugar" in Fig. 1, was constructed from data obtained before, as well as at thirty minute intervals after, the introduction into the stomach of a dog of 4 grams of dextrose per kilogram of body weight of the animal. It may be seen that the sugar produced 8 per cent. increase in catalase during the first 30-minute interval; 14 per cent. increase during the 60-minute interval; and 16, 14 and 15 per cent. increase during the succeeding intervals. Two days later, five grams of "soluble saccharin" per kilogram of body weight were introduced into the stomach of the same dog. The curve marked "saccharin" in Fig. 1, shows the results. It may be seen that the introduction of the "soluble saccharin" increased the catalase of the blood 3 per cent. during the first 30-minute interval; 10 per cent. during the 60-minute interval; 30 per cent. in 90 minutes; 54 per cent. in 120 minutes, and 56 per cent. in 150 minutes. By comparing the effect of the sugar and of the saccharin on the production of catalase, it may be seen that the saccharin produced a much more extensive increase in catalase than did the sugar.

The conclusion is drawn that in addition to being a sweetening agent, saccharin, although not oxidized itself, serves to facilitate the oxidation of the other food materials by stimulating the liver to an increased output of catalase, the enzyme in the body principally responsible for oxidation. Hence, it would seem that saccharin should be positively helpful in the diet, instead of harmful, as some have claimed, particularly in a disease such as diabetes where the principal trouble is defective oxidation.

W. E. Burge

Physiological Laboratory of the University of Illinois

THE AMERICAN ASTRONOMICAL SOCIETY

The twenty-second meeting of the society was held August 20 to 22, 1918, at the Harvard Observatory. Before the gathering it had been expected by many that war conditions would make the attendance so small that it would be scarcely worth while to hold the sessions. As might have been anticipated, however, the number of members of the society residing near Cambridge, together with the staff of the observatory, would make a respectably sized company at any time, and these with the few who were able to attend from a distance made a number which was well up to the average of previous meetings of the society. Although many astronomers about the country are actively engaged in war work, the number of papers presented showed no tendency to decrease, in fact there were the greatest number of communications ever presented at a meeting of the society. This was due primarily to two astronomical occurrences which were not affected by the war, the solar eclipse of June 8, and the appearance of the new star in Aquila. Each of these events was the occasion of about a dozen papers.

In welcoming the society in his double capacity as host and president, Professor Pickering referred to the last previous meetings at Harvard in 1910, when so many foreign astronomers were present, and he expressed the hope that it would not be too long before similar international meetings of men of science could be held again.

In the intervals between sessions the members were afforded the opportunity to inspect the instruments and work of the Harvard Observatory,

which are always a source of admiration to those who belong to less active institutions. There was a special collection of historical photographs arranged for the occasion; and other interesting features selected from the hundreds of thousands of plates now stored and making a permanent record of the sky.

A session was held at the Whitin Observatory, Wellesley College, and also at the Students' Astronomical Laboratory in Cambridge. On the day after the meeting some of the members visited the Massachusetts Institute of Technology, and others made a short cruise on Mr. W. V. Moot's yacht *Adventuress*, which is being used for instruction in navigation.

The society adopted with practically a unanimous vote a committee's recommendation that the astronomical day begin at midnight, and that after January 1, 1925, all astronomical dates should be reckoned in this way. This change will cause much trouble and confusion in astronomical work, but was recommended for the convenience of mariners.

In view of the uncertainty of what conditions would prevail in another year, the council took no definite action in regard to the time and place of the next meeting.

Officers were elected for the ensuing year:

President—Edward C. Pickering.

First Vice-president—Frank Schlesinger.

Second Vice-president—W. W. Campbell.

Secretary—Joel Stebbins.

Treasurer—Annie J. Cannon.

Councilors—E. B. Frost, 1918–20; Otto Klotz, 1918–20; E. W. Brown, 1917–19; S. A. Mitchell, 1918–19.

The program of papers was as follows:

C. G. Abbot: The Smithsonian solar constant observatory at Calama, Chile.

W. S. Adams and A. H. Joy: Spectroscopic observations of *W Ursæ Majoris*.

W. S. Adams and C. E. St. John: The green corona line at the 1918 eclipse.

Robert G. Aitken: The orbit of *Sirius*.

Robert G. Aitken: The spectral classification of 3919 visual binary stars.

Sebastian Albrecht: Personality in the estimation of tenths.

S. I. Bailey: Note on the magnitudes of the variables in *Messier 15*.

E. E. Barnard: *Nova Aquilæ No. 3*.

E. E. Barnard: The prominences of the total solar eclipse of 1918, June 8.

E. E. Barnard: Some remarkable small black spots in the milky way.

Benjamin Boss: Systematic corrections to and weights of stellar parallax.

Benjamin Boss: Real stellar motions.

Benjamin Boss: Stellar luminosities and absolute magnitudes.

Leon Campbell: The light-curve of *Nova Aquilæ No. 3*.

Annie J. Cannon: The spectrum of *Nova Aquilæ No. 3*.

J. B. Cannon: The spectroscopic binary Boss 1275.

Wm. A. Conrad: A short method of mean place reduction with natural numbers.

J. J. Crane: The reduction of Schönfeld's observations to the Harvard photometric standard of magnitudes.

Ralph E. De Lury: Simultaneous variations in solar radiation and spectroscopic determinations of the solar rotation.

Ralph E. De Lury: Spectroscopic measurements of the sun's rotation.

Ralph E. De Lury: The nature of a supposed cyclic variation in the solar rotation.

Ralph E. De Lury: A possible relationship between numbers of meteors and quantities of nitrogen compounds in freshly fallen rain and snow.

A. E. Douglass: The Steward Observatory of the University of Arizona.

A. E. Douglass: Atmospheric haze causing twilight effects.

Alice H. Farnsworth: The color-index of *Nova Aquilæ No. 3*.

Edwin B. Frost: Usefulness of "movie" camera for photographing phenomena of solar eclipses.

Edwin B. Frost and J. A. Parkhurst: The spectrum of *Nova Aquilæ* on June 8, 9 and 10, 1918.

Asaph Hall: A brief description of the 26-inch equatorial instrument of the Naval Observatory, and accessories, etc.

Asaph Hall: Account of some of the series of satellite observations made with the 26-inch equatorial.

W. E. Harper: The orbit of the spectroscopic binary *19 Lyncis*.

W. E. Harper: The orbits of the spectroscopic components of Boss 5173.

W. E. Harper: The spectrum and velocity of *Nova Aquilæ No. 3*.

Margaret Harwood: The variability of *Eros* in 1900–1901.

F. Henroteau: Note on the spectroscopic binary *55 Ursæ Majoris*.

Frank C. Jordan: Notes on the light curves of *XX Cygni* and *U Pegasi*.

Edward S. King: A new method of determining the color of a star.

Jakob Kunz and Joel Stebbins: Photometric results at the eclipse of June 8, 1918.

C. O. Lampland: Variable stars in the *Trifid Nebula* (N. G. C. 6514) and the *Lagoon Nebula* (N. G. C. 6523).

C. O. Lampland: Photographic observations of the variable nebula, N. G. C. 2261.

C. O. Lampland and E. C. Slipher: Some photographic results of the Lowell Observatory solar eclipse expedition.

Henrietta S. Leavitt: The light-curves of eleven novæ.

W. F. Meggers: Solar and terrestrial absorption in the sun's spectrum from 6400 A to 9400 A.

John A. Miller: The total eclipse of June 8, 1918.

R. M. Motherwell: *Nova Aquilæ No. 3.*

R. M. Motherwell: *12 Lacertæ.*

Margaretta Palmer: The Yale index to star catalogues.

J. A. Parkhurst: The spectrum of the solar corona at the eclipse of June 8, 1918.

C. D. Perrine: Changes in the spectra of some early-type stars showing hydrogen emission.

C. D. Perrine: Announcement concerning the formation of a new catalogue of fundamental star positions.

C. D. Perrine: The early spectrum of *Nova Aquilæ No. 3.*

E. Pettit and Hannah B. Steele: Report of the Washburn College eclipse expedition to Matheson, Colorado.

Edward C. Phillips: On a mechanical method of reducing transit observations.

Edward C. Pickering: Relation of proper motions to spectra.

J. S. Plaskett: The 72-inch reflecting telescope.

J. S. Plaskett: Notes on the spectrum of *Nova Aquilæ No. 3.*

Susan Raymond: The variability of *Antigone* (129).

William F. Rigge: The solar eclipse of 1918, June 8, as observed in Omaha.

Luis Rodés: A differential gravimeter and its applications.

Henry Norris Russell: The orbit of σ *Ursæ Majoris.*

R. F. Sanford: The spectrum of Bailey's variable star No. 95 in the globular cluster *M 3.*

R. F. Sanford: The orbit of the spectroscopic binary star *p Velorum.*

Harlow Shapley and J. C. Duncan: The globular cluster *Messier 22* (N. G. C. 6656).

V. M. Slipher: The spectra of two variable nebulæ: a new type of nebular spectrum.

V. M. Slipher: The spectrum of *Nova Aquilæ, No. 3.*

V. M. Slipher: Some spectroscopic results of the Lowell Observatory solar eclipse expedition.

C. E. St. John and Louise Ware: Notes on solar rotation.

H. T. Stetson: War-time instruction at the Harvard Astronomical Laboratory.

H. T. Stetson: Preliminary note on the uniformity of film sensitivity of photographic plates from measures with the thermo-electric photometer.

R. M. Stewart: The position of *Nova Aquilæ No. 3.*

David Todd: On the construction of high-level laboratories for scientific research.

Robert Trümpler: The position and proper-motion of *Nova Aquilæ No. 3.*

Frank W. Very: The luminiferous ether. Its relation to the electron and to a universal atmosphere.

Frank W. Very: What is the bearing of the hypothesis of a gravitational limit on the current relativity discussion?

Frank W. Very: The wasting of stellar substance.

Frank W. Very: Galactic and atomic vortices.

Frank W. Very: On Nipher's "gravitational" experiment and the anomalies of the moon's motion.

R. K. Young: The probable error of radical velocities determined with the one prism spectrograph of the Dominion Astrophysical Observatory.

Meade L. Zimmer: Preliminary note on an annual term in the right ascensions.

Joel Stebbins,
Secretary

SCIENCE

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